IN THE CLAIMS

1. (Previously Amended) A feed forward amplifier, comprising:

an input for receiving an RF signal;

a main amplifier receiving and amplifying said RF signal;

a main amplifier output sampling coupler;

a first delay coupled to the input and providing a delayed RF signal;

a carrier cancellation combiner coupling the delayed RF signal from the first delay to the sampled output from the main amplifier;

an error amplifier receiving and amplifying the output of the carrier cancellation combiner;

a second delay coupled to the output of the main amplifier;

an error coupler combining the output from the error amplifier and the delayed main amplifier output from the second delay so as to cancel distortion introduced by the main amplifier;

an output sampling coupler coupled to the error coupler output and providing a sampled output signal;

a carrier signal reduction circuit coupled to the output sampling coupler and providing a sampled output signal with a reduced carrier component; and

a spurious signal detector coupled to the carrier signal reduction circuit, comprising a variable frequency down converter and a digital signal processor, for detecting out of band distortion in the reduced carrier sampled output signal.

2. (Original) A feed forward amplifier as set out in claim 1, further comprising a controller, coupled to the spurious signal detector, for controlling the feed forward amplifier system to minimize distortion detected by the spurious signal detector.

3. (Currently Amended) A feed forward amplifier as set out in claim 1, wherein the signal path through the error amplifier has an ~~associated~~ inherent third delay associated with the signal path and wherein said second delay is substantially less than said third delay .

4. (Original) A feed forward amplifier as set out in claim 2, further comprising a gain adjuster and phase adjuster coupled between the carrier cancellation combiner and the error amplifier, wherein the controller controls the gain adjuster and phase adjuster to minimize the distortion detected by the spurious signal detector.

5. (Original)A feed forward amplifier as set out in claim 2, further comprising a gain adjuster and phase adjuster coupled between the input and the main amplifier, wherein the controller controls the gain adjuster and phase adjuster to minimize the output signal from the carrier cancellation combiner.

6. (Original) A feed forward amplifier as set out in claim 2, further comprising a predistorter coupled between the input and the main amplifier, wherein the controller controls the predistorter to minimize the distortion detected by the spurious signal detector.

7. (Original) A feed forward amplifier as set out in claim 1, wherein said carrier signal reduction circuit further comprises an input sampling coupler configured between the first delay and the carrier cancellation combiner for sampling the input RF signal and a second carrier cancellation combiner for combining the sampled output signal and the sampled input signal to cancel a carrier component in said sampled output signal.

8. (Original) A feed forward amplifier as set out in claim 7, wherein said carrier signal reduction circuit further comprises an input delay between said input sampling coupler and said second carrier cancellation combiner and an output delay between said output sampling coupler and said second carrier cancellation combiner.

9. (Original) A feed forward amplifier as set out in claim 8, wherein said carrier signal reduction circuit further comprises a gain adjuster and phase adjuster coupled between said output sampling coupler and said second carrier cancellation combiner, and wherein the controller controls said gain and phase adjuster to minimize the carrier component of the sampled output signal.

10. (Original) A feed forward amplifier as set out in claim 3, wherein said error amplifier is substantially smaller than said main amplifier.

11. (Original) A feed forward amplifier as set out in claim 10, wherein said error amplifier is about one tenth the size of said main amplifier.

12. (Original) A feed forward amplifier as set out in claim 1, wherein the reduced carrier sampled output signal provided by said carrier signal reduction circuit has a carrier component about 15 – 20 dB less than the sampled output signal provided by said output sampling coupler.

13. (Currently Amended) A feed forward amplifier as set out in claim 2, wherein said variable frequency down converter comprises a variable frequency signal generator controlled by said controller and a mixer~~,~~ coupled to receive the variable frequency signal and the sampled output signal, for converting the frequency of the ~~carrier~~ reduced carrier sampled output signal to a lower frequency signal.

14. (Previously Amended) A feed forward amplifier as set out in claim 13, wherein said spurious signal detector further comprises a bandpass filter coupled to the output of the down converter and wherein said digital signal processor is coupled to the output of the bandpass filter.

15. (Original) A feed forward amplifier as set out in claim 14, wherein said spurious signal detector further comprises an analog to digital converter coupled between the bandpass filter and the digital signal processor.

16. (Previously Amended) A delay mismatched feed forward amplifier, comprising:

an input for receiving an RF input signal;

a first control loop coupled to the input and comprising a main amplifier, a main amplifier output sampling coupler, a delay element, and a first carrier cancellation combiner;

a second control loop coupled to the first control loop and comprising a first signal path receiving the output of the main amplifier, a second signal path comprising an error amplifier receiving the output of the first carrier cancellation combiner, and an error injection coupler coupling the first and second signal paths, said first and second signal paths having a delay mismatch with said first signal path having substantially less delay than said second signal path;

an output coupled to the error injection coupler;

a third control loop coupled between the input and the output and comprising a first coupler for sampling the input, a second coupler for sampling the output, and a second carrier cancellation combiner;

a distortion detector coupled to the output of the second carrier cancellation combiner, said distortion detector comprising a digital signal processor performing a signal analysis on the output of the second carrier cancellation combiner; and

a controller, coupled to the distortion detector, for controlling at least one of the first and second control loops to minimize distortion detected by the distortion detector.

17. (Original) A feed forward amplifier as set out in claim 16, wherein said delay mismatch between said first and second signal paths is greater than 3 cycles of the RF input signal.

18. (Original) A feed forward amplifier as set out in claim 16, wherein the delay of the second signal path is about 10 – 20 ns. and the delay of the first signal path is less than about 3 ns.

19. (Original) A feed forward amplifier as set out in claim 18, wherein the delay of the second path is about 10 ns. and wherein the delay of the first signal path is about 1.0 – 1.5 ns.

20. (Original) A feed forward amplifier as set out in claim 16, wherein the delay of the first signal path is about 30 percent or less of the delay of the second signal path.

21. (Original) A feed forward amplifier as set out in claim 16, wherein said third control loop further comprises:

delay means for providing a signal delay equalization of said sampled input signal and said sampled output signal; and

gain and phase adjusting means for providing an amplitude equalization of said sampled output signal and said sampled input signal and an anti-phase addition of the sampled output signal and said sampled input signal at said second carrier cancellation combiner.

22. (Original) A feed forward amplifier as set out in claim 21, wherein the controller controls said gain and phase adjusting means to minimize the level of carrier components in the signal output from the second carrier cancellation combiner.

23. (Original) A feed forward amplifier as set out in claim 16, wherein said error amplifier is substantially smaller than said main amplifier.

24. (Original) A feed forward amplifier as set out in claim 23, wherein said error amplifier is about one tenth the size of the main amplifier.

25. (Original) A feed forward amplifier as set out in claim 16, wherein said input signal has a carrier bandwidth of about 5 MHz or less.

26. (Original) A feed forward amplifier as set out in claim 16, wherein the output of said second carrier cancellation combiner has a substantially lower power carrier component than the output signal sampled by said second coupler.

27. (Original) A feed forward amplifier as set out in claim 26, wherein the output of said second carrier cancellation combiner has about 15 – 20 dB less power than the output signal sampled by said second coupler.

28. (Previously Amended) A method for controlling an amplifier system having an input for receiving an input signal having a carrier, a control loop comprising a control loop input, a first signal path, a second signal path, and a control loop output, at least one of said first and second signal paths including an amplifier, said method comprising:

sampling a signal at the control loop output;

sampling the input signal;

combining the sampled input signal and sampled output signal to provide a combined signal with a reduced carrier component;

setting a variable frequency generator to a first frequency;

down converting the combined signal using the first frequency;

measuring the energy of the down converted signal using a digital signal processor;

adjusting the frequency of the variable frequency generator;

detecting distortion using the measured energy at different down converted frequencies; and

controlling the amplifier system using the detected distortion.

29. (Original) A method for controlling an amplifier system as set out in claim 28, wherein detecting distortion comprises detecting the carrier signal frequency band by measuring energy at different down conversion frequencies and detecting out-of-band distortion by measuring power outside of the carrier signal frequency band.

30. (Original) A method for controlling an amplifier system as set out in claim 28, wherein controlling the amplifier comprises controlling the signal characteristics of at least one of said first and second signal paths to minimize the detected distortion.

31. (Original) A method for controlling an amplifier system as set out in claim 30, further comprising:

adjusting the amplitude of at least one of the sampled output signal and sampled input signal;

adjusting the phase of at least one of the sampled input signal and sampled output signal; and

iteratively repeating said adjusting of amplitude and phase until the energy measured at the down converted frequency is less than a desired intermediate frequency threshold level.

32. (Original) A method for controlling an amplifier system as set out in claim 31, wherein said threshold level is about 15 – 20 dB below the level of the sampled output signal prior to carrier cancellation.

33. (Previously Amended) A method for amplifying an RF input signal employing feed forward compensation, comprising:

receiving an RF input signal and providing said signal on a main signal path;

sampling the RF input signal and providing the sampled RF input signal on a second signal path;

amplifying the signal on said main signal path employing a main amplifier;

sampling the main amplifier output;

delaying the sampled RF input signal on the second signal path;

coupling the delayed RF input signal to the sampled output from the main amplifier so as to cancel at least a portion of a carrier component of said sampled output from the main amplifier and provide a carrier canceled signal having a distortion component;

amplifying the carrier canceled signal employing an error amplifier to provide an error signal;

delaying the output of the main amplifier by a delay substantially less than the signal delay through the error amplifier;

combining the error signal and the delayed output of the main amplifier so as to cancel distortion introduced by the main amplifier and providing an amplified RF output;

sampling said amplified RF output;

combining the sampled amplified RF output with an anti-phase sample of the input signal to provide a carrier reduced sampled output;

down converting the carrier reduced sampled output using a variable frequency down converting signal; and

detecting out-of-band distortion using a digital signal processor to analyze the spectrum of the down converted signal.

34. (Original) A method as set out in claim 33, further comprising adjusting the gain and phase of the signal input to said error amplifier to minimize the detected out-of-band distortion.

35. (Original) A method as set out in claim 33, further comprising adjusting the gain and phase of at least one of the sampled amplified RF output and sampled input signal to reduce the carrier component of the down converted signal to a desired level.

36. (Original) A method as set out in claim 33, wherein the signal delay through the error amplifier is greater than the signal delay of the output of the main amplifier by at least 3 cycles of the RF input signal.

37. (Original) A method as set out in claim 33, wherein the signal delay through the error amplifier is about 10 – 20 ns. and the signal delay of the output of the main amplifier is less than about 3 ns.

38. (Original) A method as set out in claim 37, wherein the signal delay through the error amplifier is about 10 ns. and the signal delay of the output of the main amplifier is less than about 1.5 ns.

39. (Original) A method as set out in claim 33, wherein the signal delay of the output of the main amplifier is less than about 30 percent of the signal delay through the error amplifier.

40. (Original) A method as set out in claim 33, wherein said input signal has a carrier bandwidth of about 5 MHz or less.